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LONDON MAPPING PROGRAMME

by

Lynne Dale

NG PAPER (Demographic and Socio-economic Series) No. 10

Ottawa, November 1971



a summer student for 1969-70 and 1970-71 with Geography Section  
en done by Mr. Laurent Tessier, Chief, Drafting Unit, according to the  
designs set by Miss Dale





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## Introduction

In 1967, a trial census was conducted in London, Ontario. On the questionnaire, the place of work was asked in order to test the feasibility of adding this question to the 1971 Census. At this time, no regular tables had been established for recording these data. A computer programme was prepared to calculate commuter migrations from one census tract to another and also to determine where various occupational groups were concentrated. On the basis of these data, a series of computer maps and one paper have already been prepared by the Geography Section. However, the former are limited since they do not show flow and have been used only to map a few themes (e.g. the percentage of an occupation working in each census tract). For these reasons, the present paper intends to explore various traditional cartographic methods and examine how they can describe the phenomenon.







### Part One: Work Concentrations

The first group of maps was concerned with where the concentrations of workers were and from where they commuted.

Before showing the movements from census tract to census tract, it was desirable to have an idea of the relative importance of incommuting in each census tract. For this reason, a system of graded and shaded circles (combined) was used (Map 1). These respectively showed the number of people working in each census tract and the proportion of the labour force which consisted of incommuters. There was a wide range in the number of employees from CT to CT. Specifically, the numbers ranged from 17 in CT 39 to 5517 in CT 7. The majority of CT's employed less than 500 people. Because of this it was decided to have more circles below this figure than above. The overwhelming attraction of CT 7, the CBD, is perhaps not as evident in this map as it should be. This would seem to indicate that a more appropriate grading of circles could have been used.

From the above map, the CT's of employment attraction could be determined. Therefore a second map was drawn (Map 2) using the CT's in which 90% or more of the labour force consisted of incommuters. It was attempted to show, by means of lines, from which CT's these attractive CT's were gathering their labour forces. No scale was used; as long as a CT sent any commuters, a line was drawn from it to the attractive CT. However, even omitting CT 7, there were far too many criss-crossing lines to make this map readable. Another map was attempted using this same basic idea, but movements were limited to CT's sending more than 50 migrants to an attractive CT. This map was uninteresting because there were too few lines. Reducing this minimum figure to 20 again resulted in the other extreme, i.e., overcrowding.



Since it seemed that trying to map more than one attractive CT per map was not very feasible, a number of maps were then drawn which dealt with one attractive CT for each map. Only a few of these are included here; in particular, maps for the CBD (CT 7) and those for a peripheral work location (CT 41). The scale used for CT 7 (Map 3) could not be used for any of the other CT's since there were so many more commuters. Therefore, while the scale for CT 7 was in groups of 50 commuters, the scale for the other CT's started in groups of 25 and increased in size with higher numbers of commuters. From these maps, it was evident that the attractive CT's, whether on the periphery (e.g. 41) or downtown (e.g. 7), gathered their labour force from all over the city. Census Tracts 1, 3, 4, 22, 32, 33, 36, and 37 were the most significant for the downtown census tracts. For CT 41, these were still significant but, in addition, Census Tracts 28, 29, 30 and 31 were also important. The latter are noticeably close to the attractive CT.

A couple of cumulative types of "desire line" maps were attempted. These maps (numbered 5 to 8) are probably more easily understood when studied than explained in words. Briefly, this is what has been done: line has been drawn from a peripheral CT to CT 7. The width of the line is dependent upon the number of commuters. If the line passes through the centre of one or more CT's before reaching CT 7, the commuters from these CT's are added, increasing the width of the line. For instance, in Map 5, CT's 36 and 3 are in a straight line to CT 7. Census Tract 3 sends 308 so that in CT 3 the width of the line represents the sum of the two. The difference between Maps 5 and 6 is that a white bar on the latter indicates where a CT has been added. These cumulative maps were done in an effort to reduce the number of lines. Again, by comparing Maps 5 and 7, it is apparent that the scale used for CT 7 is not suitable for CT 41. Map 8 shows a more suitable scale for CT 41.





In conclusion, generally speaking, maps involving more than one attractive CT became somewhat cluttered. The most successful maps dealt with one CT at a time.





Part Two: Place of Residence for Men and Women  
Working in the CBD

A number of journey-to-work studies discuss the differences in commuting patterns between males and females. Therefore an attempt was made to show the distance that men and women travel to CT 7.

The first map attempting to show this consisted of flow lines from the other CT's to CT 7. However, since the scale was in groups of 50, little difference was evident between the number of males and females, one colour being used for each sex. For this reason, the map has not been included here. Therefore another type of map was drawn to show the number of males and females working in CT 7. (See Map 9.) This time, vertical blocks were placed in each CT and the scale was in groups of 25. In this case, the differences in numbers were more evident. In addition, the numbers living as well as working in CT 7 could be mapped; this was impossible to do in the former flow map. Although black and white have been used in this case for reasons of publications, colours are interesting for this kind of map.

A few conclusions about male-female residential distribution can be drawn from this map. There were more women than men living in CT's 7 and 8 and working in CT 7. In the peripheral cases, the numbers generally evened out or the number of males became predominant. Only in two cases were there significantly more women than men commuting from peripheral CT's to the CBD.



Part Three: Places of Work and Residence by Occupation

Each map in this group shows the location of work and residence for each individual occupational group (by CT). Maps were attempted for several of the occupational groups but only two are shown here. The eight occupational categories are as follows:

- (1) Managers
- (2) Professional and Technical
- (3) Clerical
- (4) Sales
- (5) Service and Recreation
- (6) Transport and Communication
- (7) Primary Industry
- (8) Craftsmen and Labourers

The maps included here are in black and white; others in colour are available at the Geography Section.

Census tracts significant for concentrations of both residents and workers are evident from these maps. For instance, there was an obvious concentration of managers in CT 7, the CBD (Map 10). Besides this, there was no other significantly attractive CT. There was no correspondingly noticeable CT of residence although a number of peripheral CT's 22, 23, 27, and 36 were evidently important labour sheds.

The professional and technical occupations also had a large number of employees working in CT 7 (Map 11). However, the concentration was far less significant than was the case for occupation 1. Proportionately the pattern of residence was not significantly different from that for occupation 1.





#### Part Four: Structure of the Labour Force by Place of Work

The computer maps mentioned in the Introduction and the maps just discussed do not deal with the structure of employment in each census tract considered as a place of work. In order to show the division of labour by CT, butterfly diagrams were designed (Map 12). The scheme allowed the number of employees in each occupational group to be shown on one map. The main purpose of drawing this map was to determine where there were concentrations of one or more occupations. In particular, there was interest in finding differences or similarities among occupational types. Because of the concentration of workers in CT 7, the CBD, a separate scale was needed for this CT and this was shown in an insert. (For problems in the preparation of the map, see Appendix.)

The managerial class showed a concentration only in the CBD. Several CT's directly to the east of the CBD had between 51 and 100 managers. The remaining CT's each had 50 or fewer in the managerial class. It is interesting to note, however, that no CT was entirely without any representatives of this group.

In comparison with other CT's, there was not such a significant concentration of people in "professional and technical occupations" in the CBD. There were other noticeable concentrations, e.g., in CT's 23, 21, 8 and 35. The former can be accounted for because of the University of Western Ontario within this CT and the latter three probably largely because of the presence of hospitals. Occupation 2 was also represented in every CT.

There were more people in clerical occupations working in the CBD than for any other occupation. There were a number of smaller concentrations outside the CBD.

Outside of the CBD, there were no significant concentrations of Sales Occupations.





There were a few noticeable concentrations of those in Service and Recreation Occupations. One of the most notable was in CT's 17 and 18 which is largely explained by the presence of DND.

There were relatively few people in Transport and Communication Occupations. There were minor concentrations in the CBD and a couple of CT's just outside the CBD.

Primary Industry was very poorly represented in London. The CBD had fewer than 100 in this class and none of the other CT's had more than 50. A large number of CT's had no workers in this group.

There were quite a few concentrations of people in the Craftmen and Labourers group. These were in the CBD as well as in a number of CT's to the east and south.

On the whole, the map was quite successful. The technique used is simple but time-consuming. The scale used was quite good although the diagrams did become somewhat crowded around the central CT's. This type of map could be quite interesting if done in colour.

A fuller discussion of occupational concentrations and reasons for these would require a detailed list of establishments.

This map allows one to attempt to classify census tracts according to their employment structure and to see where there are concentrations of occupational groups, e.g.:

No predominance of an occupational group: 5, 6, 19, 20, 21, 24, 25, 26, 27, 28, 33, 34, 38, 39

Predominance of occupation 8: 2, 10, 11, 29, 37, 40

Predominance of occupations 3 and 8: 1, 9, 12, 16, 30, 31, 41

Predominance of occupations 2 and 5: 3, 21, 35

No occupation 7: 2, 4, 5, 6, 9, 10, 12, 14, 15, 19, 21, 24, 25, 26, 27, 28, 29, 34, 35, 38, 40.



### Conclusion

This has not been meant to be a detailed study of commuting patterns in London. It should be viewed as an attempt to test certain cartographic methods as applied to journey-to-work data at the census tract level. It however shows how cartographic methods can enlighten the phenomenon and help in the understanding of commuting.





APPENDIX

The proper way to draw a butterfly diagram is to have the length of the radius proportional to the square root of the quantity, and not proportional to the quantity itself. (1)

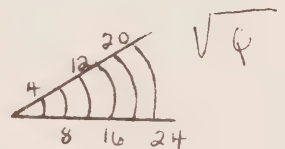
Therefore it was felt that this latter method should be tried for London. Square roots were then used to determine the size of the diagrams. However, there were some problems involving the scale of the diagrams. For example, Census Tracts 8 and 24 (the former a significantly attractive CT and the latter not so) look like this using one scale:



CT 8



CT 24



This size, considering only CT 8, is a good size for the scale of map being used. However, it seems to be far too small with regards to CT 24. This could, nevertheless, perhaps be accepted if CT 24 were the smallest CT of employment. Unfortunately, there are a number of peripheral CT's with labour forces as small as or smaller than CT 24. It is not feasible to increase the size when the attractive CT's are considered. The majority of these CT's are all concentrated to the east of the CBD. Increasing the size would mean that there would be too much overlap of diagrams among census tracts. Therefore, this method did not seem useful in this case.

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(1) Bertin, Jacques, Sémiologie Graphique. Paris: Gauthier - Villars, 1961.



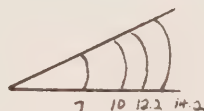
Another method was tried using the same basic principle. This time, however, the divisions of the first map were maintained (i.e., 1-50, 51-100, 101-150, 151-200, and over 200), the difference being that the interest now was with the square root of the upper limit in each group. Therefore, Census Tracts 8 and 24 now looked like this:



CT 8



CT 24



This method, however, seemed to be a poor interpretation of the use of the square roots. Since using the square root of 50 was the smallest number possible, occupations with only 3 members took on too much significance in comparison with CT 8. In general, the significant difference between CT's 8 and 24 — i.e. that the former is a far more important attractive CT — was not evident when this legend was used.

Considering the problem of drawing the symbols using square roots, it has been found that, in this particular instance, the use of absolute numbers seemed to be a more satisfactory method.





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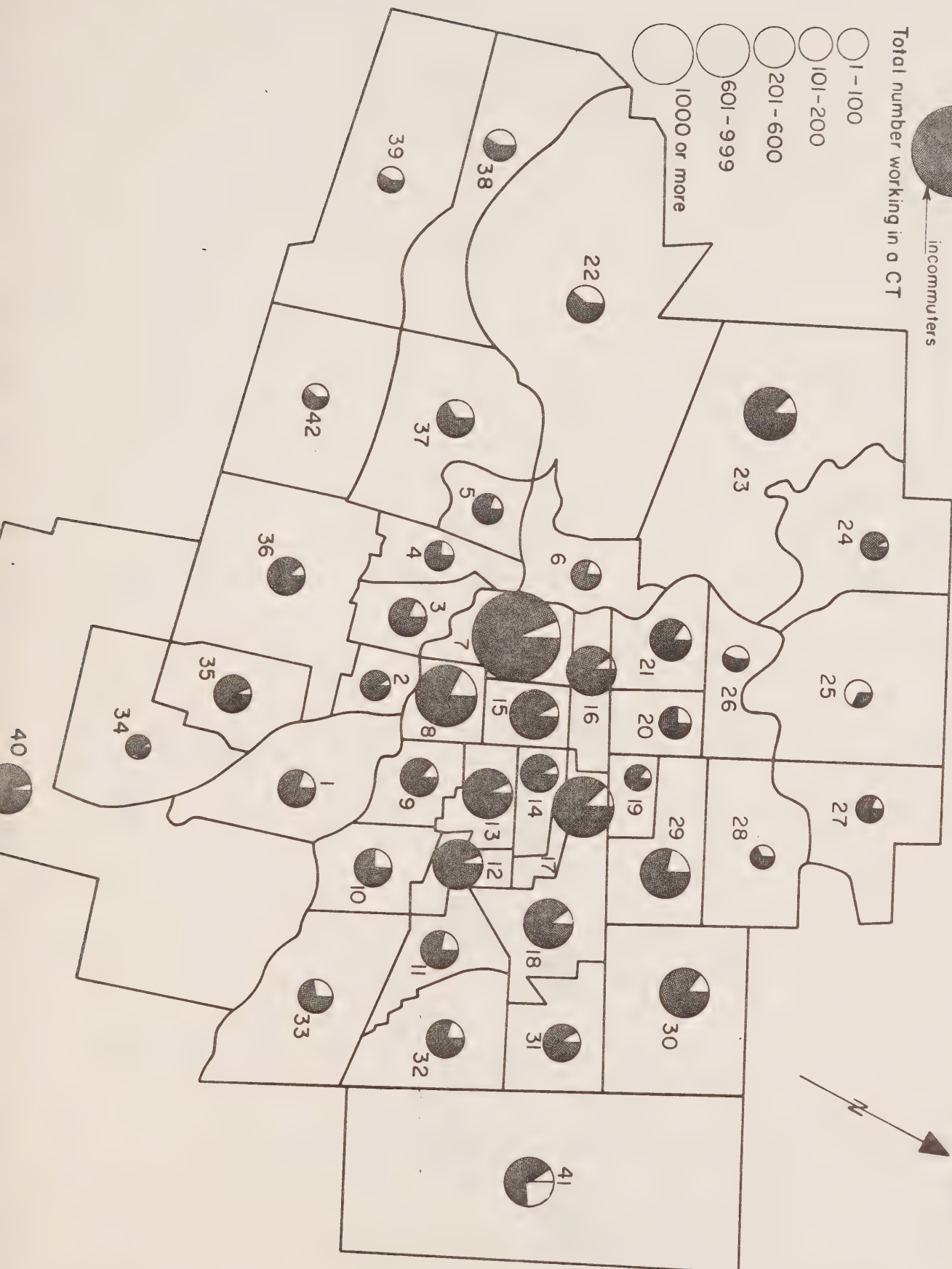
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- Simpson, J. Keith, "Mean Work-Residence Separation of the Central Business District Worker in London, Ontario", Proceedings of the Association of Canadian Geographers, June 1971.



# Percentage of commuters into all Census Tracts



Total number working in a CT



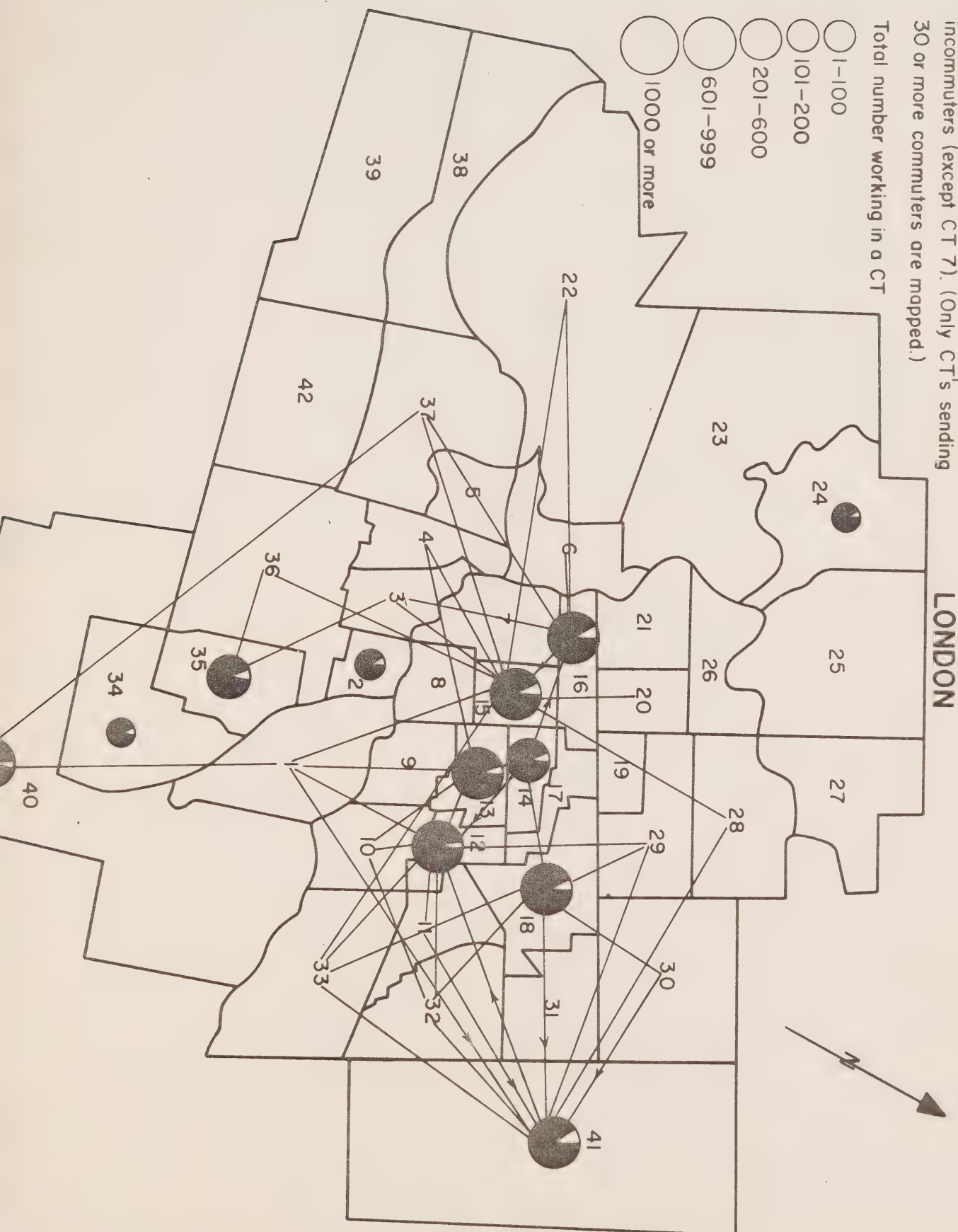




Origin of commuters to CT's in which more than 90% of the labour force consists of incommuters (except CT 7). (Only CT's sending 30 or more commuters are mapped.)

Total number working in a CT

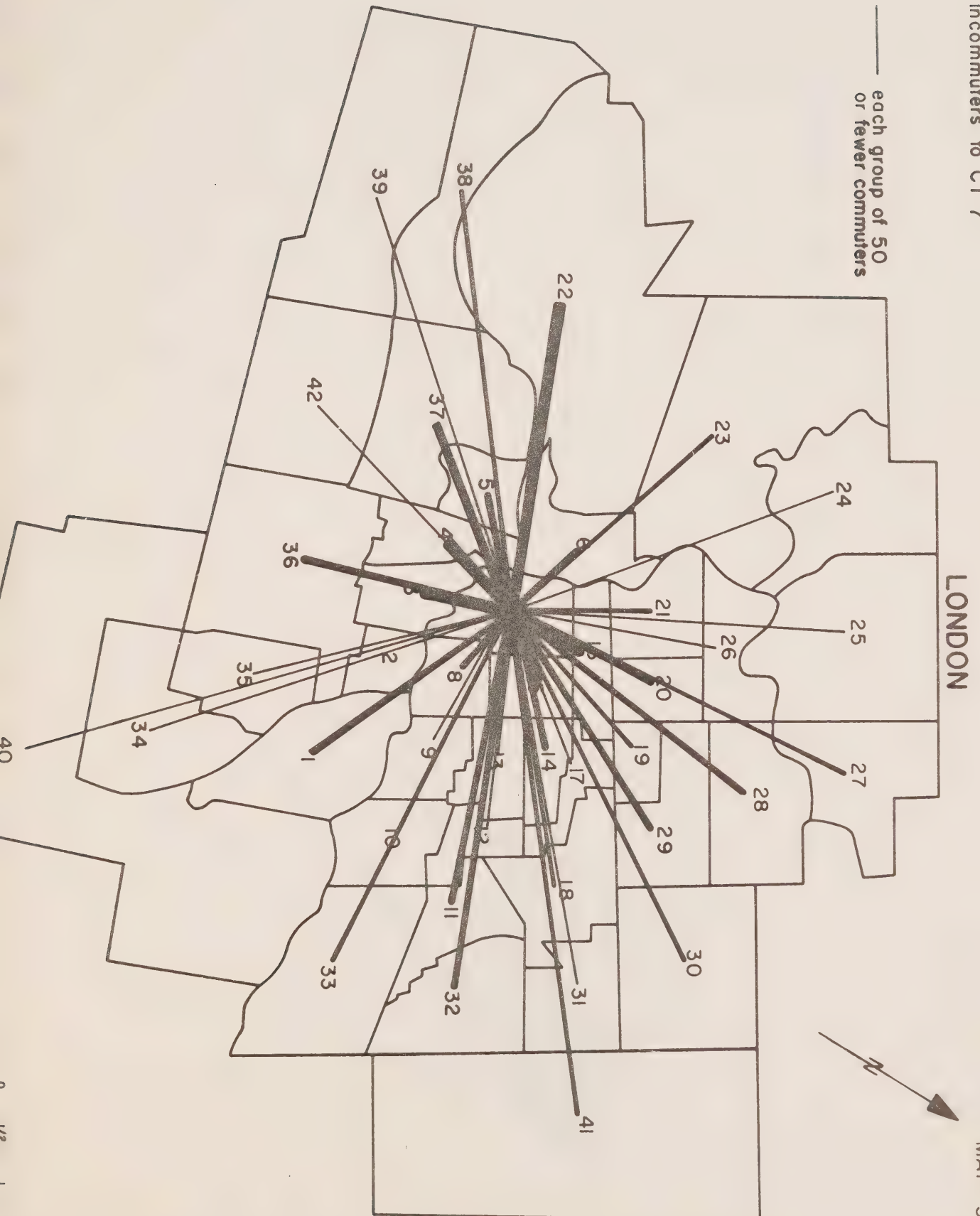
- 1-100
- 101-200
- 201-600
- 601-999
- 1000 or more





Incomputers to CT 7

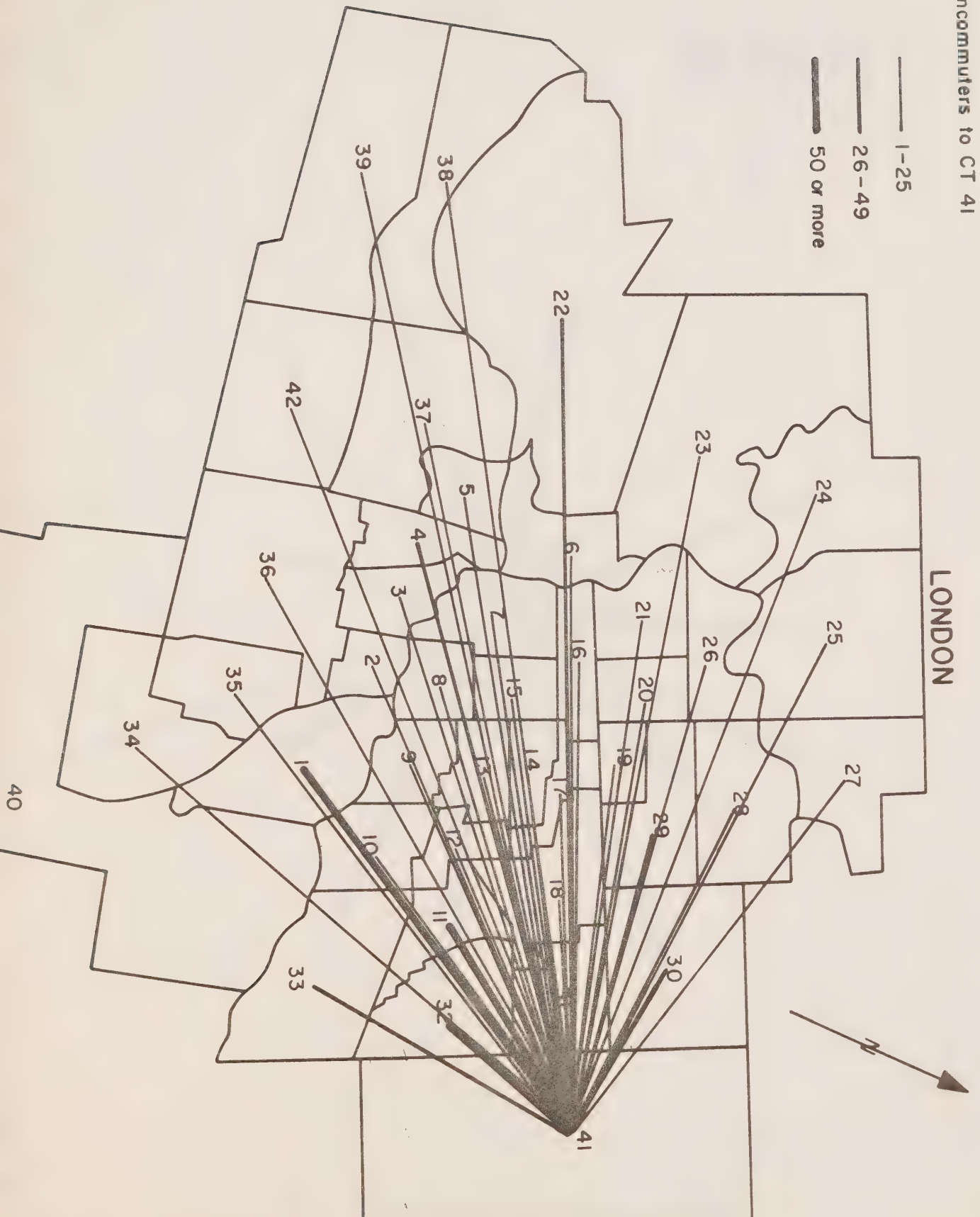
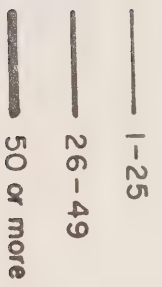
— each group of 50  
or fewer computers



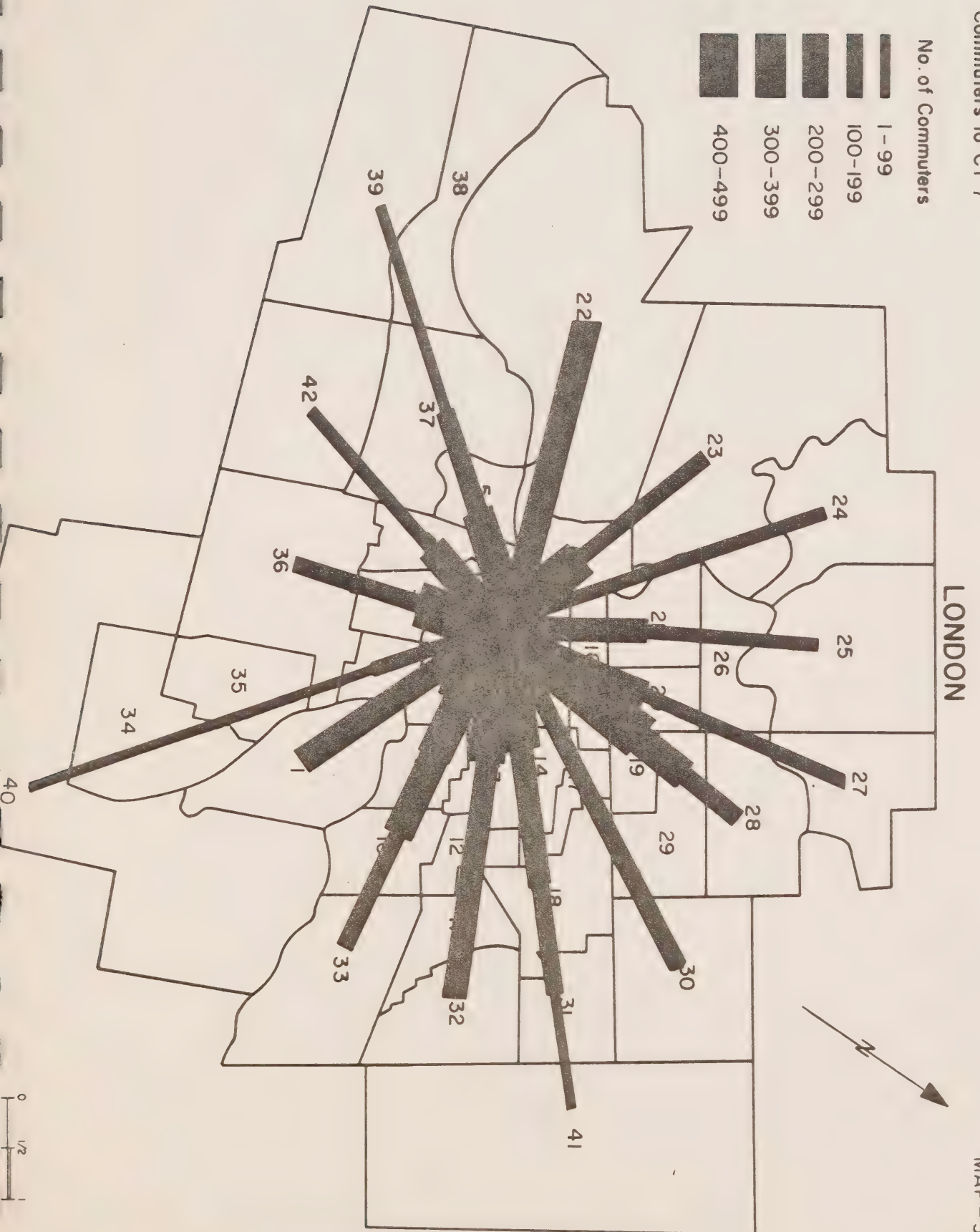




# Incommuters to CT 41

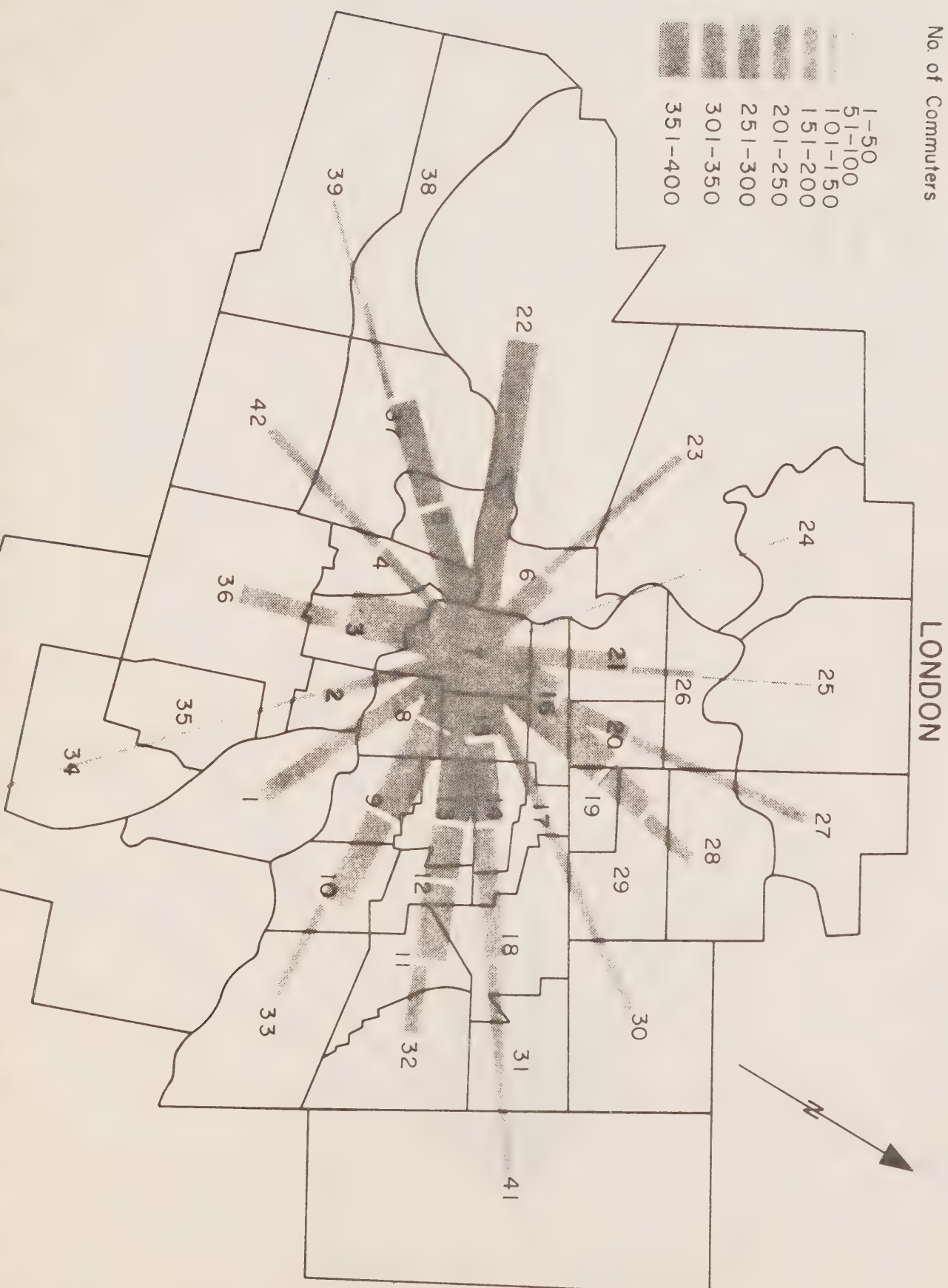
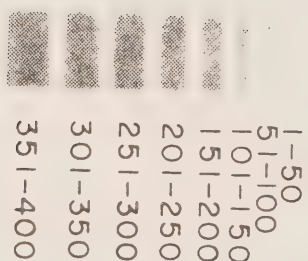






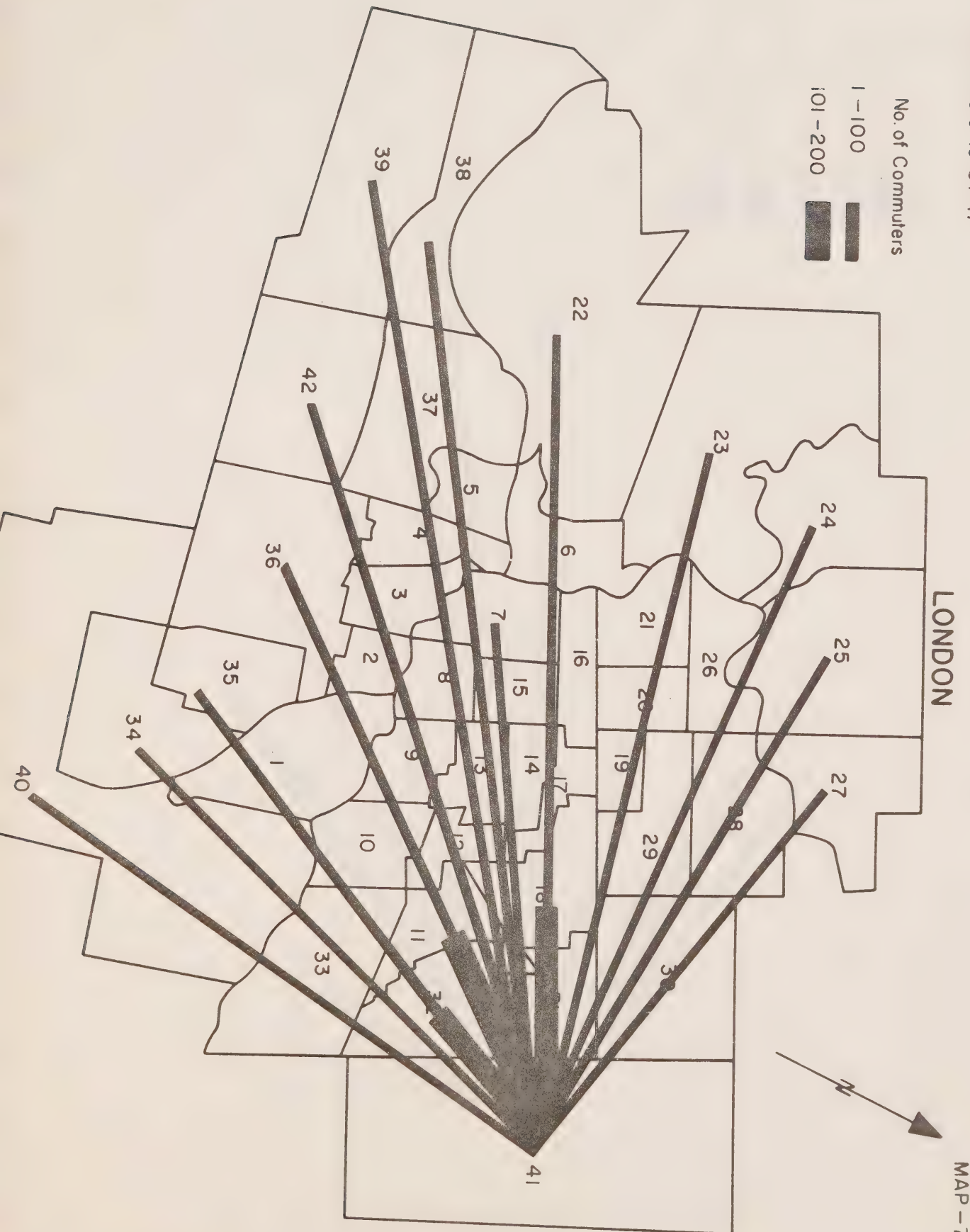


No. of Computers



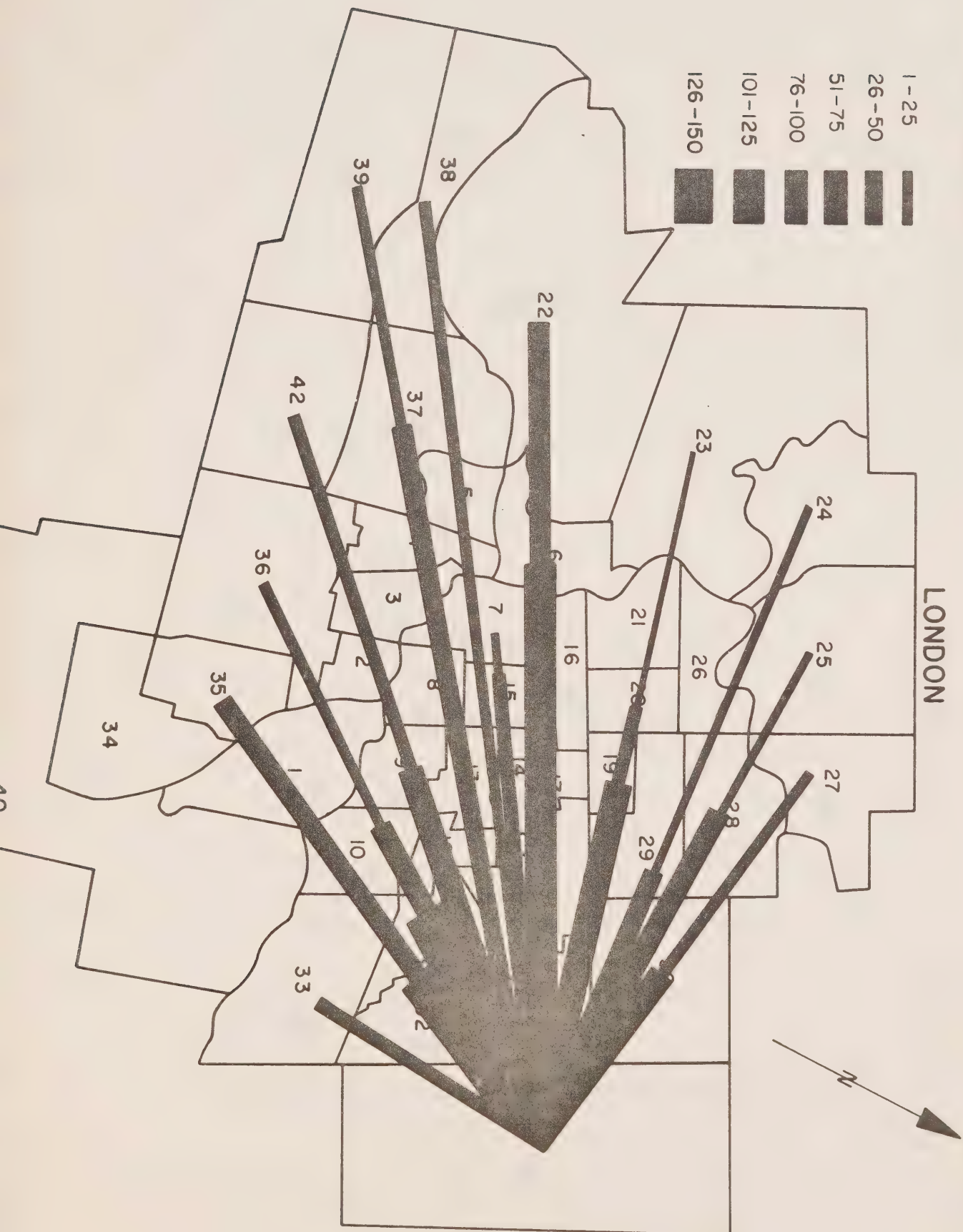
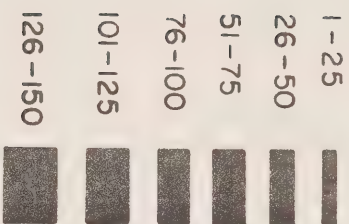








Computers to CT 41  
No. of Computers







# Males and Females working in CT-7

MALE  
FEMALE



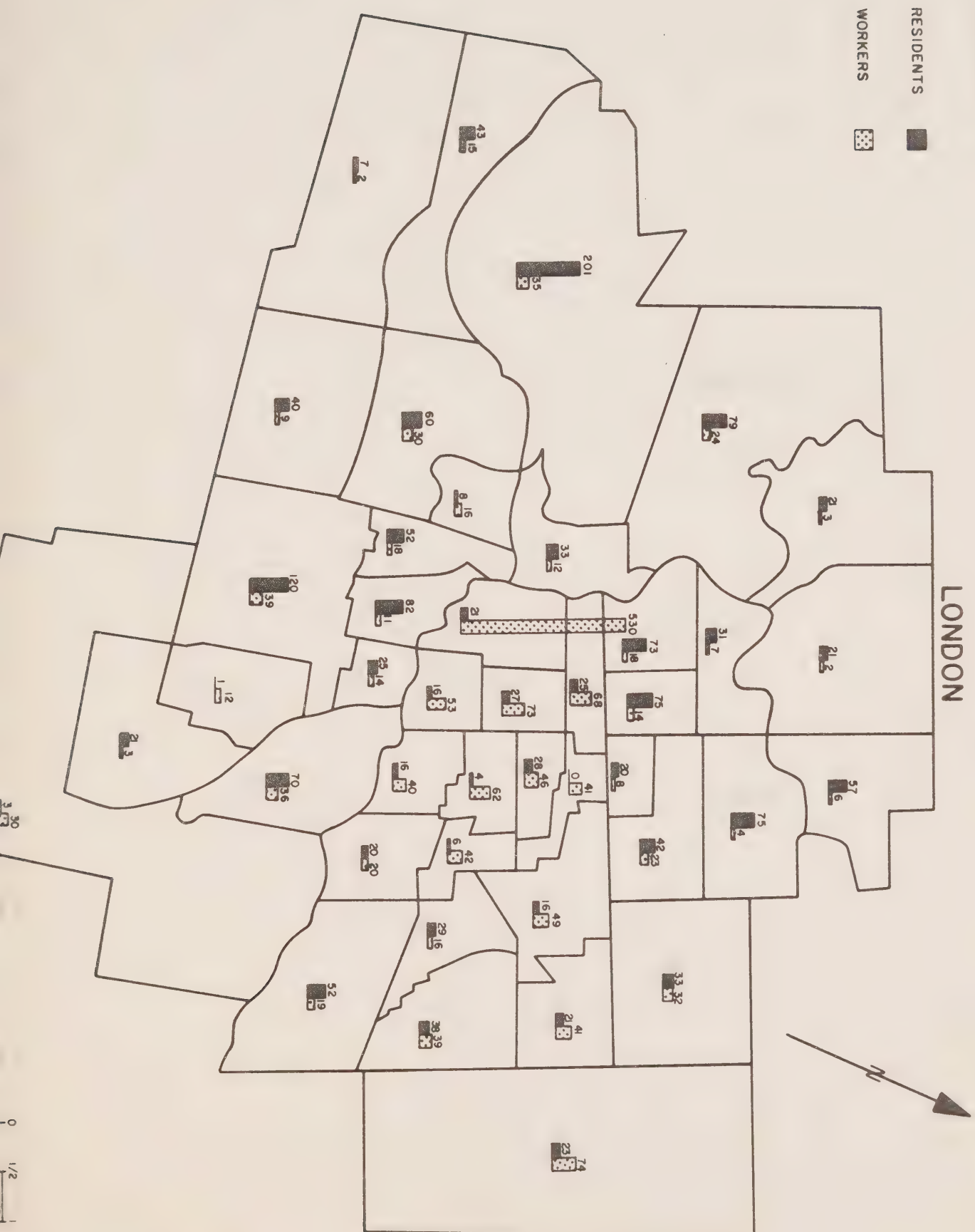
LONDON



MAP-9









# Occupation - 2

MAP-11

RESIDENTS



WORKERS

